Columbus Technical Assistance Team
June 19 & 20, 2003

Well Injection Depth Extraction (WIDE) System
Project Overview

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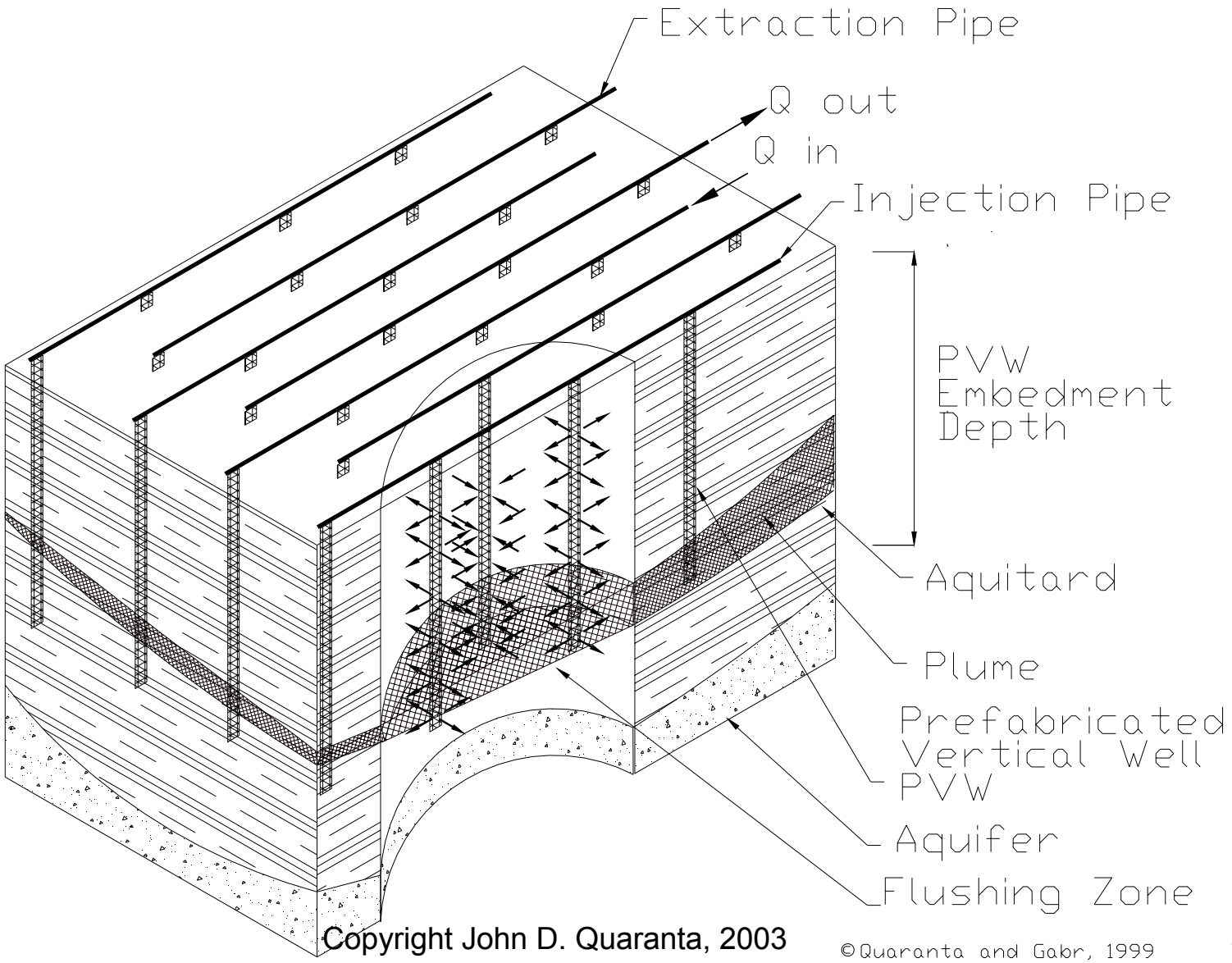
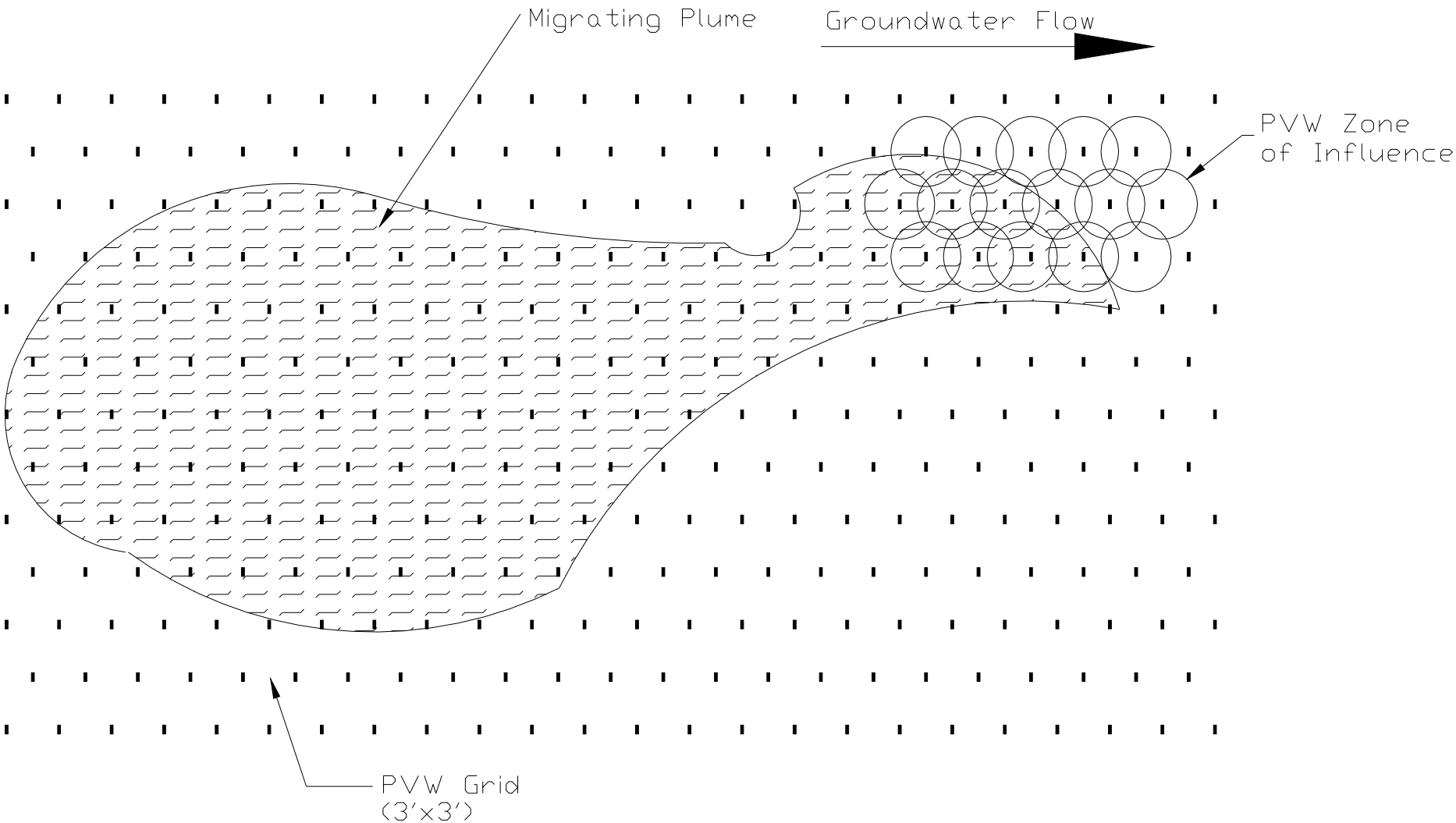
WIDE System Advantages

- **Reduced Drainage Path (2 - 5 ft) for Accelerated Flushing**
- **Redundancy for Efficient Collection**
- **Applicability to Diverse Soil Types and Conditions (Low *k* 10^{-3} *to* 10^{-8} *cm/s*, High Clay %)**
- **Target Flushing Area for Source Plume Control**
- **Cost-Effective, Rapid Installation, Off-the-shelf Components**
- **Separation of VOC and Metal Waste Streams**
- **Workers Isolated from Extracted Waste**

Well Injection Depth Extraction, (WIDE)



WIDE System - Conceptual Plan View



WIDE Deployment Timeline

Dates	Activity
March 1999	DOE-OHIO awarded EM50- ASTD
June 2000 to April 2002	Field Characterization, Engineering Design, Equipment Transfers/Purcheses
August 2002 to September 2002	Field Construction
October 2002 to April 2003	Commissioning & Start-up

Columbus Closure Project
Filter Bed Deployment Objectives

- Support Battelle w/technical assistance on design, installation, start-up and operation.

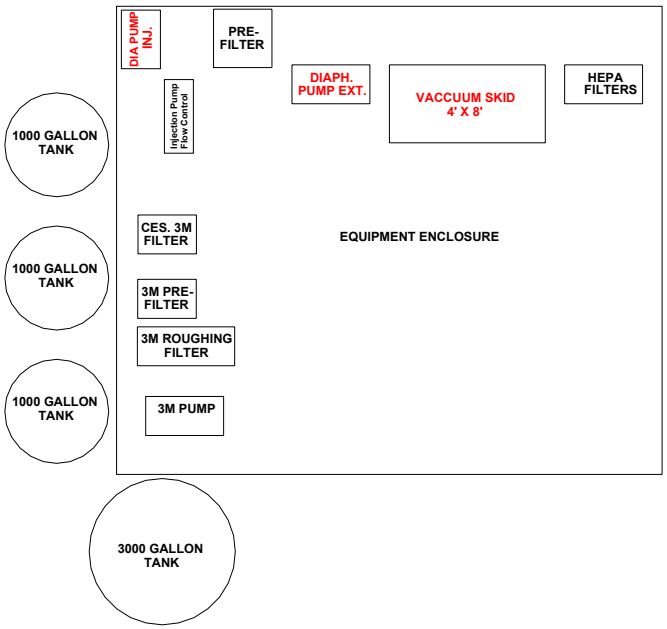
- WIDE design based on soil flushing application intended as a subsurface flushing system for injection/retrieval of liquids.

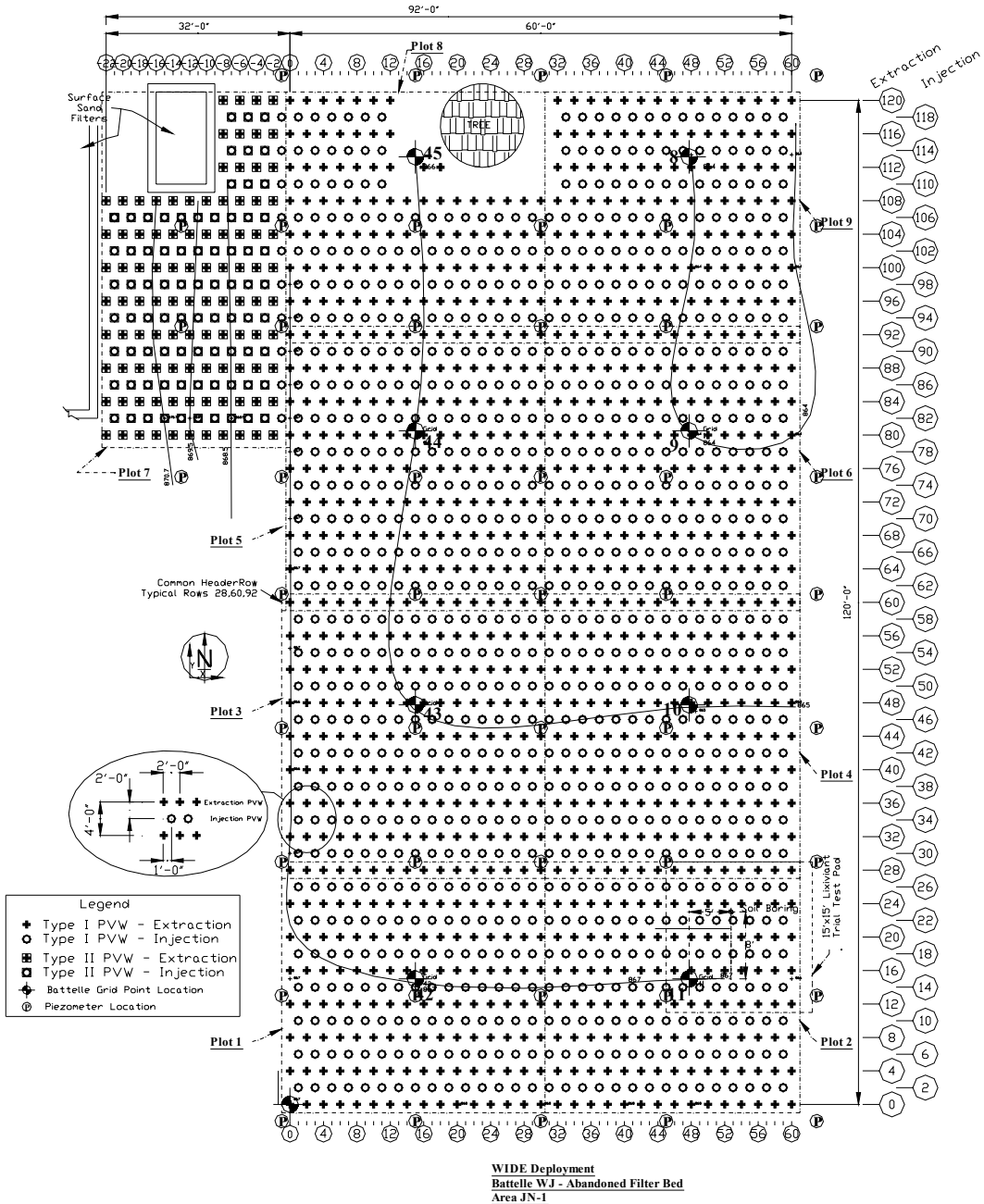
- Flushing liquid intended is Battelle, PNNL's lixiviant followed with multiple pore volume flushes with water.

- Start at 15'x15' scale to generate operational scale-up information. Advance to 30'x30' full-scale cell operation and sequence 9 cells

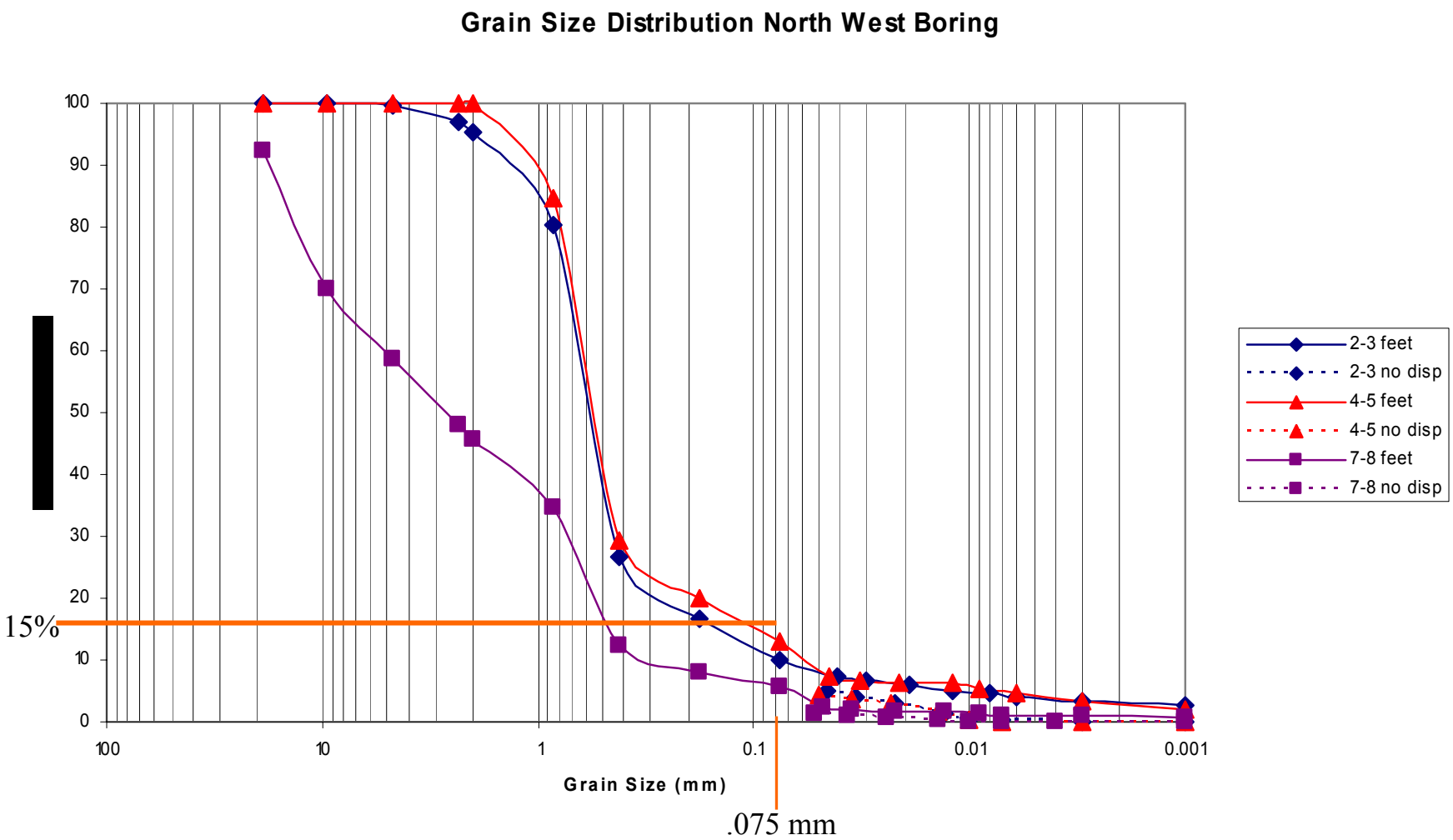
- NCSU Proposed Plan: (Start-up & Commissioning)
  - Injection Only testing
    - 15'x15' gravity & pressure completed
    - 30'x30 pressurized
  - Extraction Only (15'x15' for parameter information
    - 30'x30' for full-scale calibration)
  - Concurrent Injection / Extraction
    - 5'x15' then to 30'x30'

- Operational Plan – roll-up of Start-up results.





WIDE Deployment
Battelle WJ - Abandoned Filter Bed
Area JN-1



NC State Focus

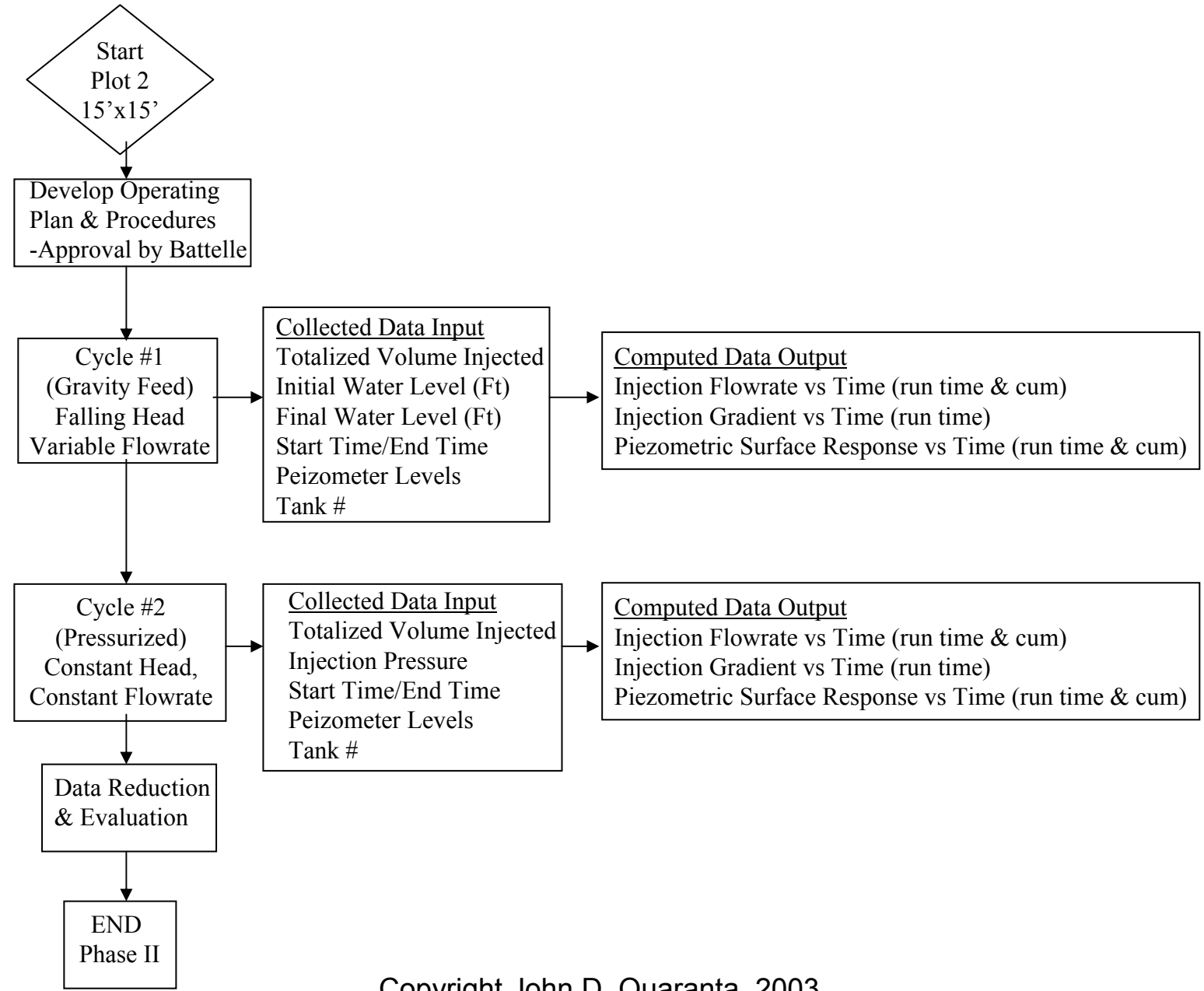
- System construction & shake-down

- Field testing on 15'x15' area of Plot 2 supported two testing cycles:
    - Gravity injection
    - Pumped injection

- Identify injection rates for optimum saturation and retention time for liquids injected into subsurface.

- Develop Groundwater model calibrated using field data and compare with model results.

Injection Only Testing



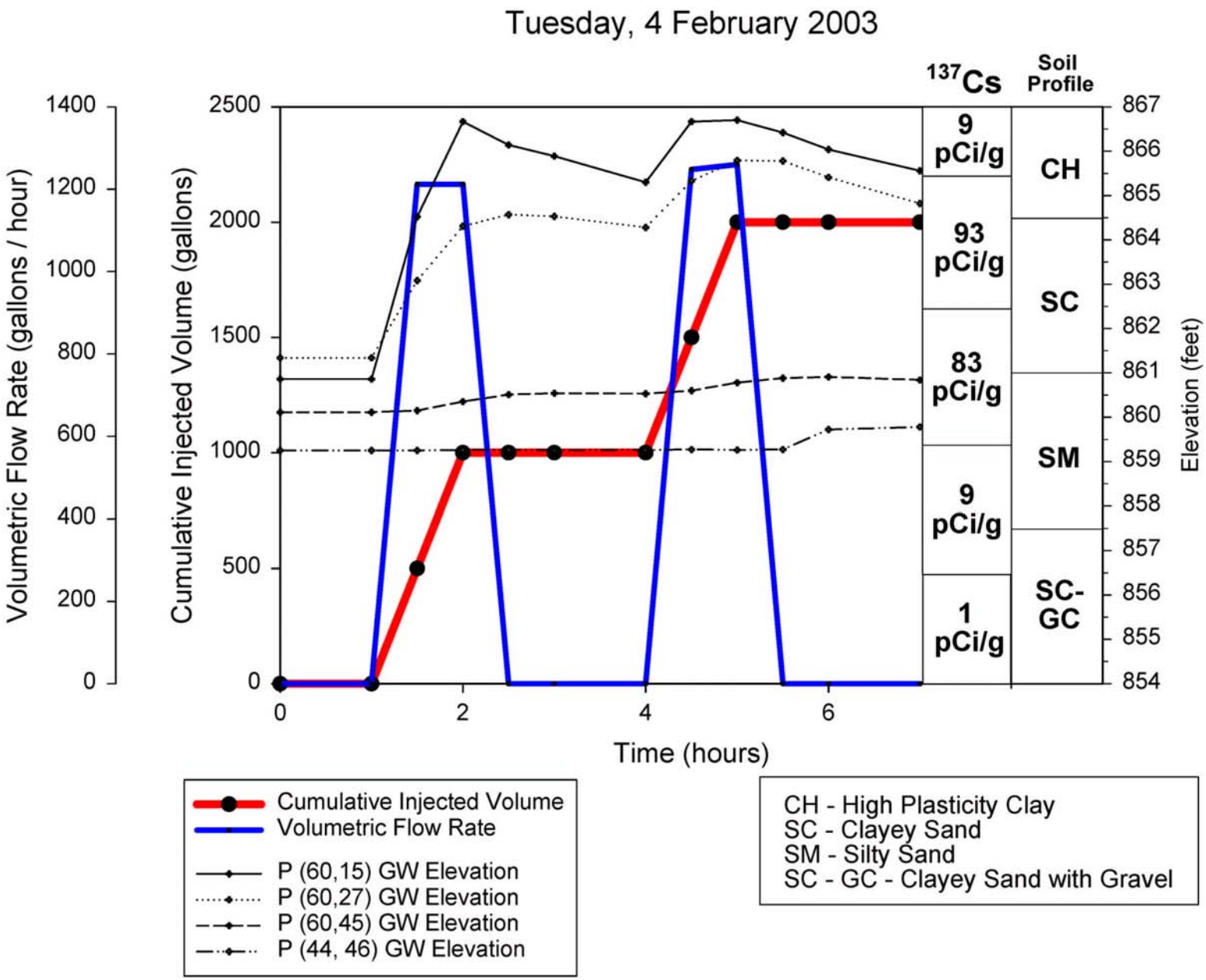


Figure 13: Field Data – 4 February 2003

Table 2: Subsurface water elevation changes by piezometer for field and modeling data

Piezometer	Field Data (feet) (3 Feb 2003)	Modeling Data (feet)
P (42,14)	+ 0.3	+ 0.0
P (60,15)	+ 6.9	+ 0.0
P (44,26)	+ 0.1	+ 0.1
P (60,27)	+ 0.4	+ 0.4

WIDE Conclusions

1. Implementation at 15'x15' grid showed ability to raise and sustain subsurface water elevations using either gravity or pressureized injection.

2. Computer modeling can be employed to effectively simulate steady-state groundwater elevations.

3. Modeling results compare reasonably well with field data for specific testing cycles and can provide understanding into liquid response to planned injection startegies and configurations for advacement of wetting fronts prior to injecting Lixiviant.

Supporting Application for WIDE

- clay/silt separation using geosynthetic filtration capabilities of Prefabricated Vertical Wells.

- reverse filter design for removal of fine-grained fraction of soil < 0.075 mm which contains >80% ^{137}Cs

- Operate WIDE for fine (clay fraction) material recovery in support of soil flushing operation.